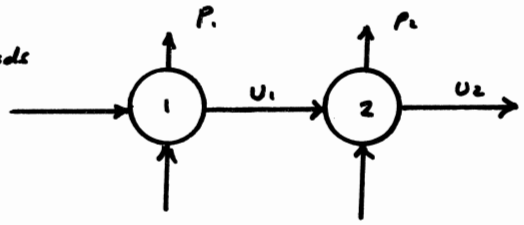
Reconsider example problem 1. Reevaluate the separation using the same total amount of solvent in a counter-current cascade. How much improvement in separation is produced?

1000 #/hr Fish Heads
70% solids
30% oil



500 #/hr solvent 500 #/hr solvent

under flow is 0.3 # solution / # solid

Find the fraction of oil recovered.

Stage 1:

solids - $700 = U_1 (1/0.3)$

oil - $300 = P_1 X_{o1} + U_1 X_{o1}$

overall (solids free) $300 + 500 = U_1 + P_1$

solving: $U_1 = 210$ #/hr

$P_1 = 800 - 210 = 590$ #/hr

$X_{o1} = 300 / (800) = 0.375$ # oil / # solution

Stage 2:

solids - $700 = U_2 (1/0.3)$

oil - $U_1 X_{o1} = P_2 X_{o2} + U_2 X_{o2}$

$210 (0.375) = (P_2 + U_2) X_{o2}$

overall (solids free) $U_1 + 500 = U_2 + P_2$

$210 + 500 = U_2 + P_2$

solving: $U_2 = 210$ #/hr

$P_2 = 710 - 210 = 500$ #/hr

$X_{o2} = 210 (.375) / (500 + 210) = 0.111$

$$\text{Recovery (\%)} = \frac{590 (.375) + 500 (0.111)}{300} \times 100$$

{ = 92.3 % }